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HYBRID MODULATION TECHNIQUE TO IMPROVE RECEIVER SENSITIVITY FOR FSO LINK PROPAGATION

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ABSTRACT

Free space optical (FSO) communication is now become a main communication due to the ability of propagation channel to operate up to Terabit per sec (Tbs) and can support high number user. The FSO suffer when experience severe weather condition. Apart from that FSO also facing threshold problem especially related with Amplitude Shift Keying - Onn Off Keying (ASK-OOK) when dealing poor signal and the biggest effect is high noise presence at receiver which led the signal to deteriorate. In this research proposed new development of transmitter and receiver design in order to reduce the impact of atmospheric attenuation and increase receiver sensitivity. In this paper focus on the analysis performance related bit rate which will compare with conventional amplitude shift keying (ASK) approach. Simulation result will be used to measure the performance and comparison between conventional and new proposed modulation double transmission balance receiver (DTBR) will also be presented. It was anticipated that proposed technique which offer a simple and inexpensive procedure capable of increasing received power, receiver sensitivity, and decreasing bit error rate would be used. The measurement of result will involve the effect of geometrical loss, data bit rate and distance propagation. Four level of synchronous transport module (STM) which is STM1(155Mbps), STM4(622Mbps), STM16(2.5Gbps) and STM64(10Gbps) will be compare the performance of bit rate. Meanwhile two different distances will test to measure the ability system extend the range transmission. From the result, the DTBR can increase 25% improvement as compare to conventional ASK.

Keywords: *Free Space Optical, Conventional ASK, Geometrical Loss, Bit Error Rate*

1. INTRODUCTION

The Free Space Optics (FSO) can be defined as an optical communication technology that uses light which usually uses a LASER source and propagate via free space to transmit data between two points [1]. This technology has the same characteristic with the fiber optic communications but only distinguished in term of medium propagation. The data of optic fiber communication are transmitted by modulated laser light in cable, while FSO data are transmitted in a narrow beam through the atmosphere. Light travels through air faster than it does through glass, so it is fair to classify FSO as optical communications at the speed of light [2].

In terms of advantages of FSO technology communication over fiber communication, the FSO is not requiring the licensing from the Federal Communications Commission (FCC). Unlike the RF communication need the licensing for frequency allocation due to RF use the frequency that less than 300 GHz. Apart from that the FSO can support the bandwidth up to 2.5Gbps if compare to RF limited to 622Mbps. The further study has successfully tested 160Gbps in laboratories and speed could potentially be able to reach Terabit range [3]. The FSO also has an attractive alternative to the excessively high cost of digging the street to lay the fiber and requiring permission from authorities for installation. This technology transmission only needs a place on a roof or behind a window to set up a transceiver. The duration of installation can be made over within a few hours or one day.

Behind the advanced of this technology, the obvious limitation in FSO is vulnerable to weather condition. This led this technology not applicable